AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Claims 1-53 (Cancelled)

54. (New): An apparatus comprising:

a first substrate having a waveguide embedded therein, the waveguide to propagate an optical signal;

a second substrate bonded over the first substrate, the second substrate having a plurality of lasers, the plurality of lasers directly over the waveguide and spaced along a length of the waveguide, the plurality of lasers to emit light in a direction that is transverse to a direction of propagation of the optical signal in the waveguide, the light emitted from the plurality of lasers to pump the optical signal.

55. (New): The apparatus of claim 54, wherein the light emitted by the plurality of lasers is emitted downward, and wherein the direction of the emitted light is perpendicular to an upper surface of the first substrate and to the direction of propagation.

56. (New): The apparatus of claim 54, further comprising a reflector disposed on an opposite side of the first substrate as the second substrate is bonded over, the reflector to reflect at least a portion of light emitted from the plurality of lasers into the waveguide, the reflected light to pump the optical signal.

57. (New): The apparatus of claim 54, wherein the plurality of lasers comprises five lasers, wherein the plurality of lasers are spaced evenly apart along the length of the waveguide, wherein the plurality of lasers have a lithographically defined spacing,

wherein the plurality of lasers each operate at less than 50 mW, and wherein the waveguide is doped with a rare earth element.

58. (New): An apparatus comprising:

a first substrate;

a waveguide embedded within the first substrate to propagate an optical signal; and

a second substrate having a plurality of light sources, the second substrate positioned over a first side of the first substrate, with the plurality of light sources spaced along a length of the waveguide, the plurality of light sources to emit light in a direction that is transverse to a direction of propagation of the optical signal in the waveguide, the light emitted from the plurality of light sources to pump the optical signal.

59. (New): The apparatus of claim 58, wherein the waveguide is directly under the plurality of light sources.

60. (New): The apparatus of claim 59, wherein the light emitted by the plurality of light sources is emitted downward and in a direction that is perpendicular to the first side of the first substrate and to the direction of propagation.

61. (New): The apparatus of claim 58, wherein the second substrate is bonded to the first substrate.

62. (New): The apparatus of claim 58, further comprising a reflector disposed on a second side of the first substrate to reflect at least a portion of light emitted from the plurality of light sources into the waveguide, the reflected light to pump the optical signal.

63. (New): The apparatus of claim 62, wherein the reflector comprises a surface adjoined to a heatsink.

64. (New): The apparatus of claim 58, wherein the plurality of light sources comprises at least five light sources.

65. (New): The apparatus of claim 58, wherein the plurality of light sources are spaced evenly apart along the length of the waveguide.

66. (New): The apparatus of claim 65, wherein the plurality of light sources have a lithographically defined spacing.

67. (New): The apparatus of claim 58, wherein the plurality of light sources each operate at less than 50 mW.

68. (New): The apparatus of claim 67, wherein the plurality of light sources each operate at less than 20 mW.

69. (New): The apparatus of claim 58, wherein the plurality of light sources comprises at least one vertical cavity surface emitting laser (VCSEL).

70. (New): The apparatus of claim 58, wherein the waveguide is doped with erbium, and wherein light emitted from the light sources has a wavelength of approximately 980 nanometers or approximately 1480 nanometers.

71. (New) A method comprising:

embedding a waveguide having a rare earth element within a first substrate;

fabricating a plurality of light sources on a second substrate; and

positioning the plurality of light sources directly over the waveguide with the light sources spaced along a length of the waveguide; and

attaching the second substrate to a first surface of the first substrate.

72. (New) The method of claim 71, further comprising bonding the second substrate to the first substrate.

73. (New) The method of claim 71, further comprising adjoining a heat sink to a second surface of the first substrate.

74. (New): The method of claim 71, wherein said positing the light sources directly over the waveguide comprises positioning at least five light sources directly over the waveguide.